1 GHz GIZMOMAX series

GIZMOMAX Line Extender
(Legacy “BLE” style)

Description:

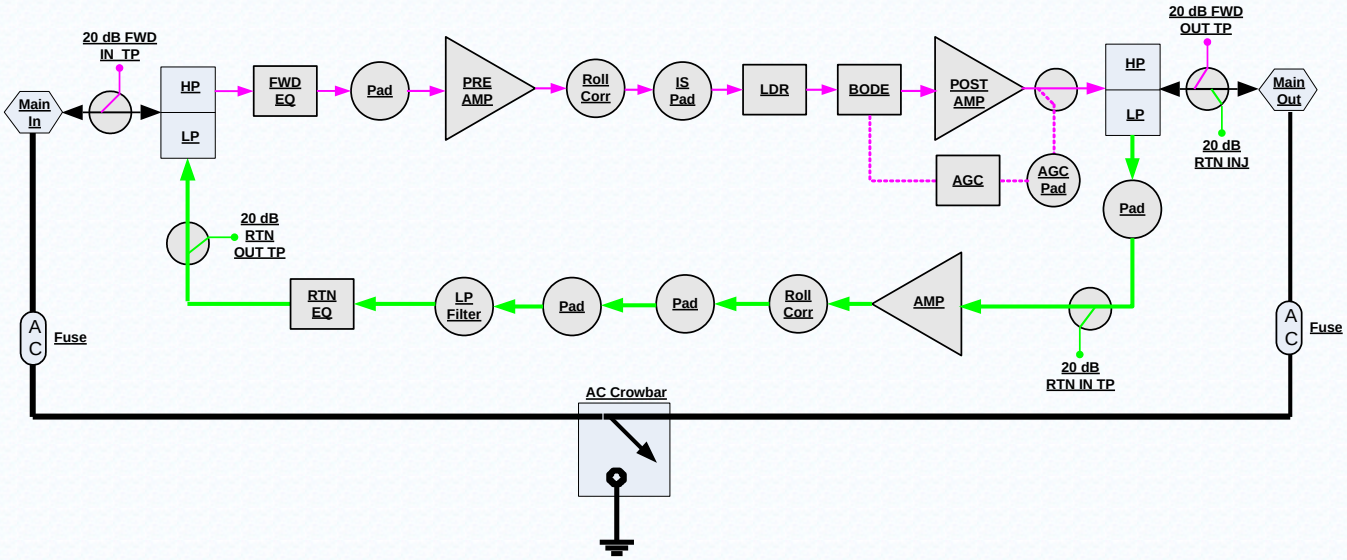
The 1 GHz GIZMOMAX series broadband line extender is essentially a “drop-in-upgrade” module that allows the customer to perform system upgrades without suffering extensive construction costs. The revolutionary GIZMOMAX LE provides better performance and enhanced features at low cost.

The GIZMOMAX LE includes a newly manufactured state-of-the-art PCB assembly, power supply, and chassis that fits into the same STARLINE JLX and BLE series housing as before. The GIZMOMAX LE is fully tested as new to ensure years of reliable service.

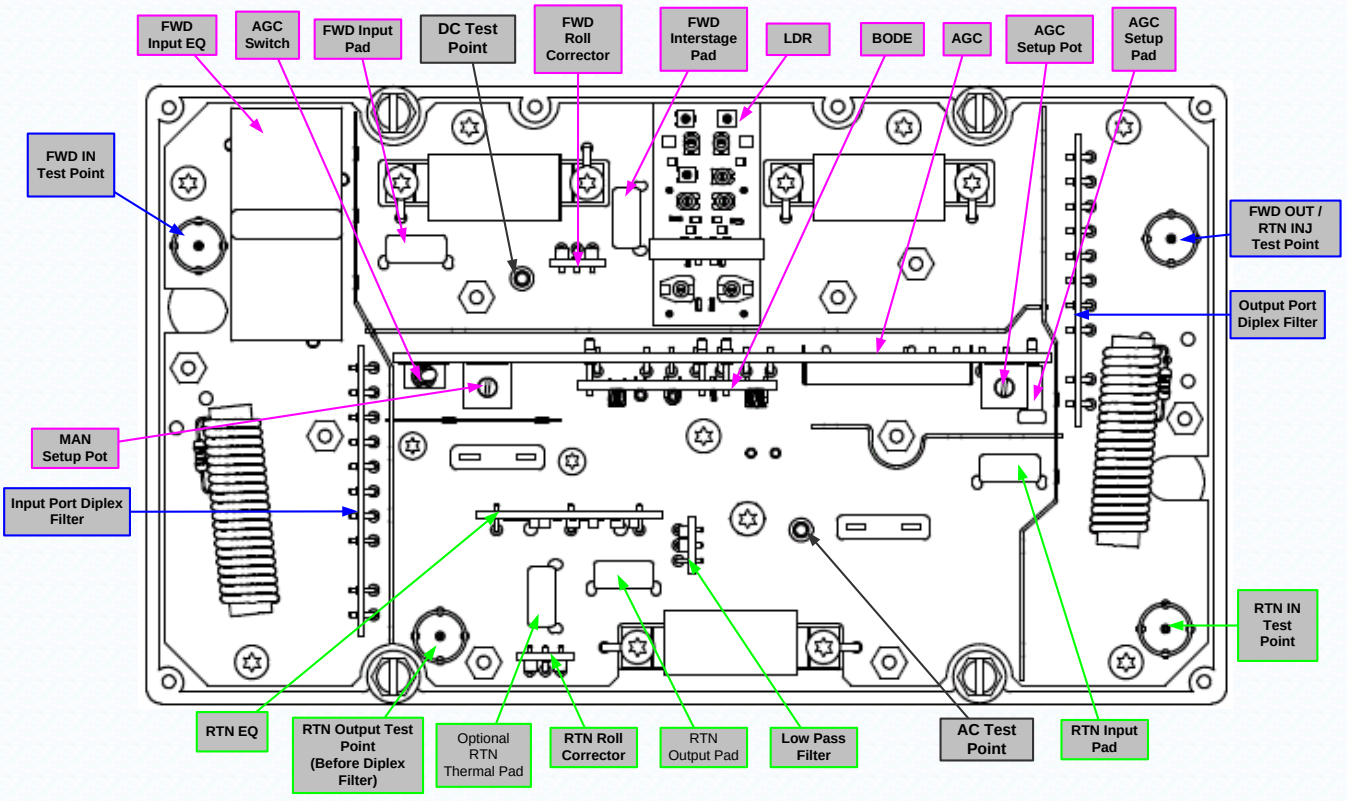
Features:

- The Industry’s first 1 GHz Motorola/General Instruments style line extender that is backwards compatible!
- Low-cost, easy-to-install, drop-in-upgrade unit that fits into existing housing offers increased gain to allow for existing spacing. Eliminates new construction altogether, or greatly reduces construction costs!
- High performance GaAsFET gain stages deliver Lowest 2^{nd} and 3^{rd} Order distortions, superior CNR, and low noise figure, while maintaining highest gain and excellent flatness in both forward & return bands.
- Computer designed, fixed component diplex filters exhibit the highest stop band isolation (>40 dB), the best return loss (>22 dB), and the lowest insertion loss available (< 0.75 dB).
- Plug and play diplex filters allow quick and low cost changes to both forward & return bands.
- Can be configured as a Manual, Thermal, or AGC controlled LE module with the use of a plug-in AGC supplied with either an analog or QAM pilot.
- Use your existing pads and equalizers at 750 MHz, 870 MHz, and 1 GHz as replacements or plant extensions.
- Improved hum modulation.
- Plug-in fuses and a Crowbar provide surge protection.
- Similar layout and look as the original Motorola/General Instruments BLE, is technician friendly, and will require minimal training.
- Line Extender module includes a complete 2-year warranty on all installed electronic assemblies.

GIZMOMAX LE Functional Block Diagram



GIZMOMAX LE Accessory Locations



Amplifier Setup

The GIZMOMAX LE is a 2-way capable single output amplifier that provides more Forward and Return path gain, higher output levels, lower noise figure, better distortion performance, and wider bandwidth than the original module. The extra bandwidth your system will achieve with this direct drop-in-upgrade module, assuming no additional amplifiers are cut in, will depend on several loss factors that the improved performance must compensate for. This includes increased dB losses due to system configuration, taps, the type and length of coax that are encountered based upon the original amplifier dB spacing. Although the physical length of the coax cable span has not increased, the dB losses and the cable dB changes due to temperature at the highest frequency channels will increase. The amplifier's extra RF gain, plug-in AGC module, and/or thermal pad will help compensate for the additional cable loss as the bandwidth increases and temperature changes, the lower noise figure improves the C/N, and the improved distortion performance increases the channel capacity.

All RF test points for the forward and return path use directional couplers that provide a -20 dB monitor. The return carriers or sweep can be injected at the forward output test point. The plug-in auto fuses/shunts provide AC power to the power supply itself and/or the output port as needed. There are AC and DC voltage test points accessible thru the cover as well as a power LED to ensure proper function of the power supply. A plug-in Crowbar provides surge protection by firing at approximately 230 VAC. The GIZMOMAX LE can be made backward compatible with the Motorola/General Instruments STARLINE JLX and BLE series housing. Before installing the GIZMOMAX LE into the existing housing, replace the seizures as needed. *Please refer to the "Line Extender Housing Upgrade Instructions" on Page 7.*

Setting the GIZMOMAX LE in Manual Mode

The forward operational gain is ***38 dB in Manual Mode*** with an output "cable" tilt of 9 dB. The gain is controlled using a plug-in Input Pad as well as an Interstage Pad *(MGIP-*)*. The tilt is controlled using a plug-in Input EQ *(MGISFE100-*)*.

1. Connect a signal-level meter to the forward input test point, measure and document the tilt and RF input level at the highest and lowest system carrier. *Note: Both carriers should be at standard analog levels, non-scrambled.*
2. Install the correct Input Pad and Input EQ to achieve the designed input level and tilt. ***Note: The RF input level at the highest frequency should not exceed +13 dBmV.***
3. Connect the signal-level meter to the forward output test point, measure and document the tilt and RF output level at the highest and lowest system carrier.
4. If the RF output level at the highest frequency is too high and the input is padded correctly, install the correct Interstage Pad. ***Note: The RF output level at the highest frequency should not exceed the maximum operating level of +51 dBmV.***
5. If the output tilt is less than required, install a higher value Input EQ.
6. If the output tilt is greater than required, install a lower value Input EQ.

Setting the GIZMOMAX LE in Thermal Mode

The forward operational gain is ***35 dB in Thermal Mode*** with an output "cable" tilt of 9 dB. The gain is controlled using a plug-in Input Pad *(MGIP-*)* as well as an Interstage Thermal Pad *(M0PA0T)*. The tilt is controlled using a plug-in Input EQ *(MGISFE100-*)*.

1. Connect a signal-level meter to the forward input test point, measure and document the tilt and RF input level at the highest and lowest system carrier. *Note: Both carriers should be at standard analog levels, non-scrambled.*
2. Install the correct Input Pad and Input EQ to achieve the designed input level and tilt. ***Note: The RF input level at the highest frequency should not exceed +16 dBmV.***
3. Connect the signal-level meter to the forward output test point, measure and document the tilt and RF output level at the highest and lowest system carrier.
4. If the RF output level at the highest frequency is too high, install the correct Input Pad. ***Note: The RF output level at the highest frequency should not exceed the maximum operating level of +51 dBmV.***
5. If the output tilt is less than required, install a higher value Input EQ.
6. If the output tilt is greater than required, install a lower value Input EQ.

Setting the GIZMOMAX LE in AGC Mode

The forward operational gain is ***35 dB in AGC Mode*** with an output "cable" tilt of 9 dB. The gain is controlled using a plug-in Input Pad as well as an Interstage Pad *(MGIP-*)*. The tilt is controlled using a plug-in Input EQ *(MGISFE100-*)*. In addition, the plug-in AGC module provides a manual gain control as well as an automatic gain control.

1. Ensure the AGC switch is in the MAN position (Manual Mode).
2. Connect a signal-level meter to the forward input test point, measure and document the tilt and RF input level at the highest and lowest system carrier. *Note: Both carriers should be at standard analog levels, non-scrambled.*
3. Install the correct Input Pad and Input EQ to achieve the designed input level and tilt. ***Note: The RF input level at the highest frequency should not exceed +16 dBmV.***
4. Connect the signal-level meter to the forward output test point and ensure there is at least 3.5 dB of reserved gain at the highest system carrier. Adjust the manual gain control if needed. *Note: The GIZMOMAX LE is factory set to have 3.5 dB of reserved gain at 1002 MHz.*
5. Measure and document the tilt and RF output level at the highest and lowest system carrier as well as the pilot carrier.
6. If the RF output level at the highest frequency is too high and the input is padded correctly, install the correct Interstage Pad. ***Note: The RF output level at the highest frequency should not exceed the maximum operating level of +51 dBmV.***
7. If the output tilt is less than required, install a higher value Input EQ.
8. If the output tilt is greater than required, install a lower value Input EQ.
9. Put the AGC switch in the AGC position (AGC Mode).
10. Connect the signal-level meter to the forward output test point and measure the RF output level at the highest system carrier.
11. Adjust the automatic gain control until the RF output level matches the RF output level obtained in Manual Mode.

Note: The plug-in AGC pad is factory set for an amplifier output level range from +39 to +49 dBmV at the pilot frequency for an Analog AGC and +36 to +46 dBmV at the pilot frequency for a QAM AGC. You can change this pad (MGIP-) depending on the operational output of the GIZMOMAX LE.*

Return Path Alignment

The return operational gain is ***23 dB***. The gain is controlled using a plug-in Return Input Pad as well as a Return Output Pad *(MGIP-*)*. The tilt is controlled using a plug-in Return EQ *(MGIRESEE*-*)*.

1. Set up the return optical link using the design input reference levels for the return transmitter and the system design output levels of the return path receiver. This must be done before you balance any return amplifiers.
2. Document what the amplifier's RF input reference levels are.
3. Use the -20 dB Forward Output test point to inject the return carriers or sweep.
4. Verify that the Return Input Pad is an *MGIP-00* (0 dB).
5. Install the design value Return Output Pad.
6. Install the design value Return EQ.
7. Set the sweep output to the design reference level and set the sweep output for a -20 dB test point.
8. Change the Return Output Pad and/or Return EQ until the swept response matches, as close as possible, the stored reference sweep taken at the optical node.
9. Document sweep levels used as well as the Return Pads and Return EQ values.

Using Amplifiers In Lower Frequency Systems

When using the GIZMOMAX LE line extender in a 1 GHz distribution system, you must use an *MGISFE100-** equalizer. For use in lower frequency systems, such as 750 MHz or 870 MHz, you must consider the best method for handling the reduced bandwidth and channel-loading requirement. If you use 1 GHz equalizers in lower frequency systems, you will need to take into account the reduced gain from 1 GHz. Due to the amplifier tilt, there will be some loss in gain from the published operational gain specification at 1 GHz.

To avoid any additional loss in gain, it is optimal to use the equalizers that match the system frequency. For a 750 MHz system, use 750 MHz equalizers. For an 870 MHz system, use 870 MHz equalizers.

GIZMOMAX LE Model Options

			1	2	3	4	5	6	7		8	9	10	11	12	13	14	15
M	L	1	x	x	x	x	x	x	x	-	x	x	x	U	x	2	B	x

1-2	Bandwidth
75	750 MHz
87	870 MHz
1G	1002 MHz

3	Diplex Filter Split
C	40/51 MHz
D	40/54 MHz
E	42/54 MHz
F	55/70 MHz
G	65/85 MHz

4-5	Forward Path Operational Gain	
XX	XX dB	
35	35 dB	(AGC & Thermal Level Control Options)
38	38 dB	(Manual Level Control Option)

6-7	Forward Path Station Tilt
XX	XX dB
09	9 dB

8	Forward Level Control Option
M	Manual Gain Control
T	Thermal Gain Control
1	AGC with 427.25 MHz Analog Pilot
3	AGC with 499.25 MHz Analog Pilot
5	AGC with 609 MHz QAM Pilot
6	AGC with 711 MHz QAM Pilot

9-10	Return Path Operational Gain
XX	XX dB
23	23 dB

11	RF Test Point Location
U	Access through RF Module Cover

12	Housing Option
D	Station Deep Lid Housing Included
H	Station Housing Included
M	RF Module Only (No Housing)

13	AC Input Voltage
2	60-90 VAC

14	AC Current Handling
B	15 Amp Capacity

15	AC Fuse
1	25 Amp Fuses Installed
2	Shunts Installed

** Additional options are available, please contact your sales representative.

Standard RF Specifications

Parameter	Units	Forward	Reverse	Notes
Pass Band	MHz	54-1002	5-40	
Amplifier Type	-	GaAsFET PD	Silicon	
Flatness	dB	+/-0.70	+/-0.5	1,2
Minimum Full Gain	dB	Manual / Thermal / AGC 39 / 36 / 39.5	24	2
Operational Gain	dB	Manual / Thermal / AGC 38 / 35 / 35	23	3
AGC Range @ 1002 MHz	dB	+3.5/-4.0	-	
Return Loss (minimum)	dB	-16	-16	2
Test Points	dB	-20 (+/-0.75)	-20 (+/-0.75)	2
Noise Figure (typical)	dB	8.0	5.5	2,4
Hum Modulation @ 15 A	dBc	-60 (54-1002 MHz)	-55 (5-10 MHz) -60 (11-40 MHz)	
Distortion Measurements @ Rated Level in Manual Mode				
Reference Frequencies	MHz	1002 / 870 / 750 / 550 / 54	40 / 5	
Recommended Input Levels	dBmV	13 / 12.1 / 11.1 / 9.5 / 6	12 / 12	3
Recommended Output Levels	dBmV	51 / 49.3 / 47.4 / 44.6 / 36	35 / 35	3
Channel Loading	NTSC	78 (CW) with Digital	6	5
CTB	dBc	-72	-87	5
CSO (high side)	dBc	-79	-87	5
Cross Modulation	dBc	-65	-68	5,6
Distortion Measurements @ Rated Level in Thermal Mode				
Reference Frequencies	MHz	1002 / 870 / 750 / 550 / 54	40 / 5	
Recommended Input Levels	dBmV	16 / 15.1 / 14.1 / 12.5 / 9	12 / 12	3
Recommended Output Levels	dBmV	51 / 49.3 / 47.4 / 44.6 / 36	35 / 35	3
Channel Loading	NTSC	78 (CW) with Digital	6	5
CTB	dBc	-72	-87	5
CSO (high side)	dBc	-79	-87	5
Cross Modulation	dBc	-65	-68	5,6
Distortion Measurements @ Rated Level in AGC Mode				
Reference Frequencies	MHz	1002 / 870 / 750 / 550 / 54	40 / 5	
Recommended Input Levels	dBmV	16 / 15.1 / 14.1 / 12.5 / 9	12 / 12	3
Recommended Output Levels	dBmV	51 / 49.3 / 47.4 / 44.6 / 36	35 / 35	3
Channel Loading	NTSC	78 (CW) with Digital	6	5
CTB	dBc	-72	-87	5
CSO (high side)	dBc	-79	-87	5
Cross Modulation	dBc	-65	-68	5,6
Powering Data				
AC Bypass Current (continuous)	A	15		
AC Voltage, 60 Hz	-	@ 90V	@ 60V	
AC Current Draw	mA	500 (typ) / 520 (max)	680 (typ) / 700 (max)	
DC Current Draw @ 24V +/-0.5V		810 (typ) / 885 (max)	810 (typ) / 885 (max)	

Delay Characteristics (typical, note 2)

Forward (Chrominance to Luminance Delay)		**Reverse** (Group Delay in 1.5 MHz bandwidth)	
55.25 - 58.83 MHz	20 ns	5.0 - 6.5 MHz	71 ns
61.25 - 64.83 MHz	10 ns	6.5 - 8.0 MHz	25 ns
67.25 - 70.83 MHz	6 ns	8.0 - 9.5 MHz	13 ns
77.25 - 80.83 MHz	4 ns	35.5 - 37.0 MHz	11 ns
		37.0 - 38.5 MHz	16 ns
		38.5 - 40.0 MHz	21 ns

Notes:

1. Measured with 9 dB of simulated cable.
2. Measured using an Interstage EQ/Mop-up = MGLA090 and 0 dB plug-ins for all remaining forward and return locations.
3. Includes a 1 dB loss from the Input EQ, a 1 dB loss from the Return EQ, and 3.5 dB of Bode slope reserved gain if applicable.
4. The forward Noise Figure is 8.5 dB worst-case and the return is 6.0 dB worst-case over the specified pass band.
5. Distortions with 78 CW NTSC channels and AWGN Digital loading -6dBc relative to analog carrier levels from 550 MHz to 1002 MHz.
6. X-mod (@ 15.75 KHz) specified using 100% synchronous modulation.

Line Extender Housing Upgrade Instructions	
Type of Housing	**Amp Capacity**
STARLINE JLX, BLE	10 Amp version / 15 Amp version

Follow the upgrade instructions below to convert the Line Extender Housing from 10 Amps to 15 Amps.

1. If the seizures are 10 Amps, replace them both using the BLE-15A platform assembly kit part number **951941-006-00**.
2. If the seizures are 15-amps, nothing needs to be done.

Accessories	
Factory Installed Plug-ins	**Plug-in Series**
Diplex Filters (not accessible thru the cover, field upgradeable)	MLE300XDF-*
Interstage Pad = Factory Selected	MGIP-*
Interstage EQ/Mop-up	MGLA090
Return Input Pad = MGIP-00	MGIP-*
Low Pass Filter (not accessible thru the cover, field upgradeable)	MLERF100104
Fuse 1, Fuse 2 = Shunt Auto Fuse	30731-0035
230V AC Crowbar Surge Protector	MLE300SATCB
Required Plug-ins	**Plug-in Series**
Input EQ	MGISFE100-*
Input Pad	MGIP-*
Return Output Pad	MGIP-*
Return EQ	MGIRESEE*-*
Optional Plug-ins	**Plug-in Series**
Forward Roll Corrector (not accessible thru the cover, field upgradeable)	MLE1202FRC-*
Thermal Pad	M0PA0T
AGC Module (Analog Pilots: 427.25, 499.25 MHz) (QAM Pilots: 609, 711 MHz)	MGAA*2
Plug-in Pads for the AGC Module	MGIP-*
Return Roll Corrector (not accessible thru the cover, field upgradeable)	MLE1202RRC-*
25 Amp Auto Fuse	0189940-25
Plug-in diplex filter options include 40/51, 40/54, 42/54, 55/70, and 65/85 MHz.	-